

In yet another embodiment of the present invention, the equivalent oxide mol% of  $\text{GeO}_2$  in the dispersion varies from 1.0 to 5.0.

In still another embodiment of the present invention,  $\text{GeO}_2$  was added through  $\text{Ge}(\text{OC}_2\text{H}_5)_4$  in the silica sol.

In yet another embodiment of the present invention, the equivalent oxide mol% of  $\text{Al}_2\text{O}_3$  in the dispersion ranges from 0.5 to 4.0.

In further embodiment of the present invention,  $\text{Al}_2\text{O}_3$  is provided to the solvent in the form of aluminium salts such as chlorides, nitrates or any other salt soluble in the solvent.

In yet another embodiment of the present invention, the solution of aluminium salt is prepared using a solvent selected from alcohol and water.

In still another embodiment of the present invention, the oxide mol% of  $\text{RE}_2\text{O}_3$  in the dispersion ranges from 0.01 to 0.60.

In yet another embodiment of the present invention, strong mineral acids used for preparing the sol for dispersion are selected from hydrochloric or nitric acid.

In still another embodiment of the present invention, the alcohol selected is soluable in the dispersion system.

In yet another embodiment of the present invention, the alcohol is selected from the group comprising of methyl alcohol, ethyl alcohol, propan-1-ol, propan-2-ol, butan-1-ol and butan-2-ol.

In yet another embodiment of the present invention, pH of the dispersion ranges from 1 to 5.

In still another embodiment of the present invention viscosity of the dispersion varies from 1 to 10 mPa s.

In yet another embodiment of the present invention sonication time of the dispersion ranges from 30 to 200 minutes.

In still another embodiment of the present invention settling time of the dispersion varies from 1 to 10 hours.

In yet another embodiment of the present invention lifting speed of the tube from the dispersion ranges from 4 to 15 cm/min.

In still another embodiment of the present invention baking temperature of the coated tube varies from 70° to 150°C.

In yet another embodiment of the present invention baking time of the coated tube ranges from 0.5 to 5 h.

In still another embodiment of the present invention the core composition is selected from the group comprising of  $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2$ ,  $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2 + \text{Al}_2\text{O}_3$ ,  $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2 + \text{Al}_2\text{O}_3 + \text{P}_2\text{O}_5$  and  $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2 + \text{P}_2\text{O}_5$ .

In still another embodiment of the present invention the temperature of the RE oxide containing core layer is increased in steps of 50 to 200°C during sintering depending on the composition and Al/RE concentration of the core layer.

In yet another embodiment of the present invention, the mixture of  $\text{O}_2$  and He is in the range of 3:1 to 9:1 during sintering.

In still another embodiment of the present invention, source of chlorine is  $\text{CCl}_4$  where helium is used as carrier gas.

In yet another embodiment of the present invention, the proportion of  $\text{Cl}_2$ :  $\text{O}_2$  during drying varies from 1.5 : 1 to 3.5 : 1.

In still another embodiment of the present invention, the dehydration period lies between 1 to 2 hours.

In yet another embodiment of the present invention, the core layer is sintered in the presence of germania to facilitate germania incorporation and to obtain appropriate numerical aperture value.

In still another embodiment of the present invention, germania is supplied to the core layer during sintering by including  $\text{GeCl}_4$  with the input oxygen.

In another embodiment of the present invention, the sintering is carried out at a temperature of 1200°C to 1400°C.

In yet another embodiment of the present invention, depending on the composition of the core,  $\text{POCl}_3$  is added to the input gas mixture during sintering.

In another embodiment of the present invention, the core layer is doped with  $\text{P}_2\text{O}_5$  to facilitate RE incorporation.

In still another embodiment of the present invention  $P_2O_5$  and  $GeO_2$  concentrations vary from 0.5 to 5.0 mol% and 3.0 to 25.0 mol% respectively in the RE doped core layer of the preform.

In yet another embodiment of the present invention the numerical aperture of the fibre is varied from 0.10 to 0.30.

In another embodiment of the present invention, RE concentration in the core is maintained in the range of 50 to 4000 ppm to produce fibres suitable for application as amplifiers, fibre lasers and sensors or different purposes.

In a further embodiment of the present invention, codopants like Al and other rare earths are added to the core doped with a selected RE to fabricate fibres containing various dopants in the core in the concentration range of 50 to 5000 ppm and numerical aperture varying between 0.10 and 0.30.

In still another embodiment of the present invention the deposition of a porous soot layer at high temperature ( $1000^\circ\text{C}$  or above) by CVD process inside a fused silica glass tube or on a seed rod (VAD or OVD apparatus) is eliminated for formation of the core.

In yet another embodiment of the present invention better control is achieved over the characteristics of the coated layer like porosity, thickness etc. and uniformity along the length of the tube.

In still another embodiment of the present invention the difficulties and uncertainties involved in incorporation of the rare-earth ions in desired concentration into the porous soot layer by the solution-doping technique and such other methods are eliminated.

In still another embodiment of the present invention the rare-earth oxide coated silica nanoparticles are dispersed at ambient temperature in the silica sol mentioned above under sonication thereby eliminating the possibility of formation of the microcrystallites and clusters of rare-earth ions as in the conventional techniques.

In yet another embodiment of the present invention the possibility of evaporation of RE salts at high temperatures is considerably eliminated due to the direct addition of RE oxides which prevents change in composition including variation of RE concentration in the core and also reduces the possibility of formation of RE dip at the core centre.